WHAT IS CLAIMED IS:

1. A fuel injection valve, comprising:

1) a valve seat member including;

a) a valve seat face for allowing a valve body to be seated thereon when the valve body is closed, and

b) an injection port formed on a downstream side of the valve seat face; and

2) a nozzle plate connected to the valve seat member and disposed on a downstream side of the injection port, the nozzle plate being formed with a plurality of nozzle holes, the nozzle holes being defined radially outwardly with respect to the injection port, a fuel passage having a cross section substantially perpendicular to an axis of the injection port, the cross section of the fuel passage having a diameter which is substantially gradually increased, the fuel passage being defined in such a manner as to connect the injection port of the valve seat member to the nozzle holes of the nozzle plate.

2. The fuel injection valve as claimed in claim 1, wherein

the fuel passage is so formed in the valve seat member as to be shaped substantially into a cone having a diameter which is substantially gradually and continuously increased toward an outlet of the injection port.

3. The fuel injection valve as claimed in claim 2, wherein

the fuel passage is so formed in the valve seat member as to be shaped substantially into a frustum of the cone.

4. The fuel injection valve as claimed in claim 1, wherein

the fuel passage is formed by tapering, such that a section is so formed as to have a diameter which is substantially gradually increased from substantially a center section of the nozzle plate to the nozzle holes which are defined radially outwardly with respect to the center section, the center section of the nozzle plate being opposed to the injection port.

5. The fuel injection valve as claimed in claim 1, wherein

the fuel passage is formed by curving, such that a section is so formed as to have a diameter which is substantially gradually increased from substantially a center section of the nozzle plate to the nozzle holes which are defined radially outwardly with respect to the center section, the center section of the nozzle plate being opposed to the injection port.

6. The fuel injection valve as claimed in claim 3, wherein

a fuel outflowing from the injection port is conveyed to the frustum of the cone of the fuel passage, converting a direction of a fuel flow from axially downwardly to radially outwardly,

the cross section of the fuel passage from the outlet to the nozzle holes is expressed as a cross section of a cylinder which is defined substantially around a center axis of the injection port,

a following expression 1 is obtained:

expression 1: $Si = 2\pi \cdot Ri \cdot Hi$

where

Si is an inlet cross section,

Ri is a radius of injection port, and

Hi is a height from the upper face of the nozzle plate,

a following expression 2 is obtained:

expression 2: $So = 2\pi \cdot Ro \cdot Ho$

where

So is an outlet cross section on the nozzle holes,

Ro is a radius in this position, and

Ho is a height from the upper face of nozzle plate,

forming a ceiling shaped substantially into a taper from an inlet to the outlet makes the radius Ro greater than the radius Ri and the height Ho smaller than the height Hi, and allows a height H smaller in accordance with an increase in the radius R from the inlet to the outlet, thereby controlling an increase in the cross section of the fuel passage covering the above region,

setting up an angle of a taper such that the outlet cross section So = the inlet cross section Si and thereby Hi/Ho = Ro/Ri makes the cross section of the fuel passage substantially constant from the inlet to the outlet, while setting up a greater angle of the taper such that the inlet cross section Si > the outlet cross section So and thereby Hi/Ho > Ro/Ri decreases the cross section of the fuel passage at a constant rate from the inlet to the outlet, and

setting a total cross section Sn which is cross sections of the plurality of the nozzle holes smaller than or equal to the outlet cross section So substantially monotonously decreases the cross section of the fuel passage from the inlet to the nozzle holes.

7. The fuel injection valve as claimed in claim 4, wherein

from an inlet to the nozzle holes of the fuel injection valve, the cross section of the fuel passage is formed substantially constant or substantially gradually decreased, with this, a fuel speed in the fuel passage is made constant or increased, thereby accelerating at least one of an atomization and a vaporization of a fuel, and

from the injection port of the valve seat member to the nozzle holes by way of the fuel passage of the fuel injection valve, the cross section of the fuel passage is decreased substantially monotonously, with this, the fuel speed of the fuel injected from the nozzle holes by way of the fuel passage is made constant or increased, thereby further accelerating the at least one of the atomization and the vaporization of the fuel.

8. The fuel injection valve as claimed in claim 5, wherein

from an inlet to the nozzle holes of the fuel injection valve, the cross section of the fuel passage is formed substantially constant or substantially gradually decreased, with this, a fuel speed in the fuel passage is made constant or increased, thereby accelerating at least one of an atomization and a vaporization of a fuel, and

from the injection port of the valve seat member to the nozzle holes by way of the fuel passage of the fuel injection valve, the cross section of the fuel passage is decreased substantially monotonously, with this, the fuel speed of the fuel injected from the nozzle holes by way of the fuel passage is made constant or increased, thereby further accelerating the at least one of the atomization and the vaporization of the fuel.